IN THE CLAIMS:

The following is a complete listing of claims in this application.

1. (currently amended) A method of extracting in a vacuum ~~(4)~~ electrons emitted from a cathode situated in spaced-apart relationship with an anode which is placed at a given potential relative to the cathode by means of a bias source, the method comprising:

making a cathode presenting at least one junction ~~(9)~~ between a metal serving as a reservoir of electrons and an n-type semiconductor, the junction possessing a surface potential barrier with a height in a range of 0.05 to 0.5 eV, the n-type semiconductor presenting an emission surface for electrons and having a thickness lying in a range of 1 nm to 20 nm, defined by the value of the lowering desired for the surface potential barrier;

injecting electrons through the metal/semiconductor junction to create a space charge in the semiconductor sufficient to lower the surface potential barrier of the semiconductor to a value that is less than or equal to 1 eV relative to the Fermi level of the metal; and

using the bias source that creates an electric field in the vacuum to control the height of the surface potential barrier of the n-type semiconductor, so as to modify in reversible manner the electron affinity of the n-type semiconductor surface in order to control the emission of an electron flux towards the anode.

2. (previously presented) A method according to claim 1, wherein the bias source is controlled so as to create an electric field suitable for causing the height of the surface potential barrier of the n-type semiconductor to be greater than the level of the states occupied by electrons in the n-

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type semiconductor so as to obtain an emission surface that does not emit electrons.

3. (previously presented) A method according to claim 1, wherein the bias source is controlled so as to create an electric field suitable for causing the height of the surface potential barrier of the n-type semiconductor to be substantially equal to the level of the states occupied by electrons in the n-type semiconductor, in order to obtain an emission surface having low electron affinity.

4. (previously presented) A method according to claim 1, wherein the bias source is controlled so as to create an electric field suitable for causing the height of the surface potential barrier of the n-type semiconductor to be lower than the level of the states occupied by electrons in the n-type semiconductor so as to obtain an emission surface of negative electron affinity.

5. (currently amended) A method according to claim 1, wherein the temperature of the cathode is controlled in order to control the flux of the emitted electron beam.

6. (previously presented) A device for extracting in a vacuum electrons emitted from a cathode situated in a spaced-apart relationship with at least one anode placed at a given potential relative to the cathode by means of a bias source, the device:

· an emission cathode having at least one junction between a metal and an n-type semiconductor, possessing a surface potential barrier with a height in a range of 0.05 to 0.5 eV, the n-type semiconductor presenting an emission surface for electrons and possessing thickness lying in the range 1 nm to 20 nm defined by the value of the lowering desired for the surface potential barrier; and

· a bias source creating an electric field in the vacuum

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serving firstly to inject electrons through the metal/semiconductor junction so as to create a space charge in the semiconductor sufficient to lower the surface potential barrier of the semiconductor to a value that is less than or equal to 1 eV relative to the Fermi level of the metal, and also to control the height of the surface potential barrier of the n-type semiconductor, i.e. to reversibly modify the electron affinity of the surface of the n-type semiconductor in order to control electron flux emission.

7. (previously presented) A device according to claim 6, including an electron extraction electrode followed by an anode for receiving the extracted electrons.

8. (previously presented) An electron emission cathode for a device for extracting an electron beam in a vacuum in accordance with claim 6, the cathode comprising:

· a first portion forming an electron reservoir and constituted by at least one metal layer; and

· a second portion forming a conduction medium for the electrons injected into the metal layer and formed by an n-type semiconductor co-operating with the metal layer to define a metal/semiconductor junction possessing a potential barrier with a height in a range of 0.05 to 0.5 eV, the n-type semiconductor presenting an emission surface for the electrons, and possessing thickness lying in the range 1 nm to 20 nm defined by the value of the lowering desired for the surface potential barrier.

9. (previously presented) An emission cathode according to claim 8, the metal/ semiconductor junction possesses a potential barrier of height lying in the range of approximately 0.1 eV.

10. (previously presented) A cathode according to claim 8, wherein the first portion forming an electron reservoir is

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formed by a metal layer carried on a substrate of metal, semiconductor, or insulation.

11. (previously presented) A cathode according to claim 8, wherein the n-type semiconductor possesses an emission surface for electrons that is substantially planar.

12. (previously presented) A cathode according to claim 8, wherein the n-type semiconductor possesses an emission surface for electrons that presents projections enabling electron emission to be confined in register with each of them.

13. (previously presented) A cathode according to claim 11, wherein the n-type semiconductor possesses an emission surface for electrons presenting projections made in determined locations by lithographic techniques.

14. (previously presented) A cathode according to claim 11, wherein the n-type semiconductor possesses an emission surface for electrons presenting projections in the form of points, obtained by ion bombardment of the metal layer deposited on an insulating substrate.

Claim 15 (canceled).

16. (previously presented) A cathode according to claim 10, wherein the substrate possesses an individual point shape or an individual pinhead shape for use in an individual electron gun.

Claims 17-18 (canceled).

19. (previously presented) A method according to claim 1, wherein the metal-semiconductor junction possesses a potential barrier of height lying in the range of approximately 0.1 eV.

20. (previously presented) A device according to claim 6, wherein the metal-semiconductor junction possesses a potential barrier of height lying in the range of approximately 0.1 eV.

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